

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 9/10/21**

Leveraging over 15 years of support to HHS for medical consequence modeling and our proprietary artificial intelligence (AI) models, IEM believes that our Coronavirus model outputs can be used to assist localities and their medical facilities to better prepare for an increase in hospitalizations, to better plan for and locate drive-through testing facilities, and to determine where increased levels of transmission may be occurring.

We have been refining our AI model over the past month and are confident in its ability to provide accurate 7-day projections that can be used for operational and logistical planning.

AI-based Model Background

IEM is currently using an AI model to fit data from various sources and project new cases of COVID-19. We do not assume the average number of secondary infections (R-value) stays the same over time. IEM's AI model finds the best R-value over time to evaluate how it changes over the course of the outbreak. The IEM modeling team is running ~11 million simulations to fit each state's data and using the best fit for the R-value to project new cases over the next 7 days. The AI models are executed on a daily basis to evaluate the changing dynamics of the COVID-19 pandemic. Our projections have typically been within 10%, and are often within 5%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 9/10/21 9 a.m.

Please provide any feedback or send any questions that you might have to us. We are continually updating and improving the model, so your feedback is critical.

Also, if you have more current or refined data for your State, Commonwealth or Territory that you would like IEM to factor in, please let us know.

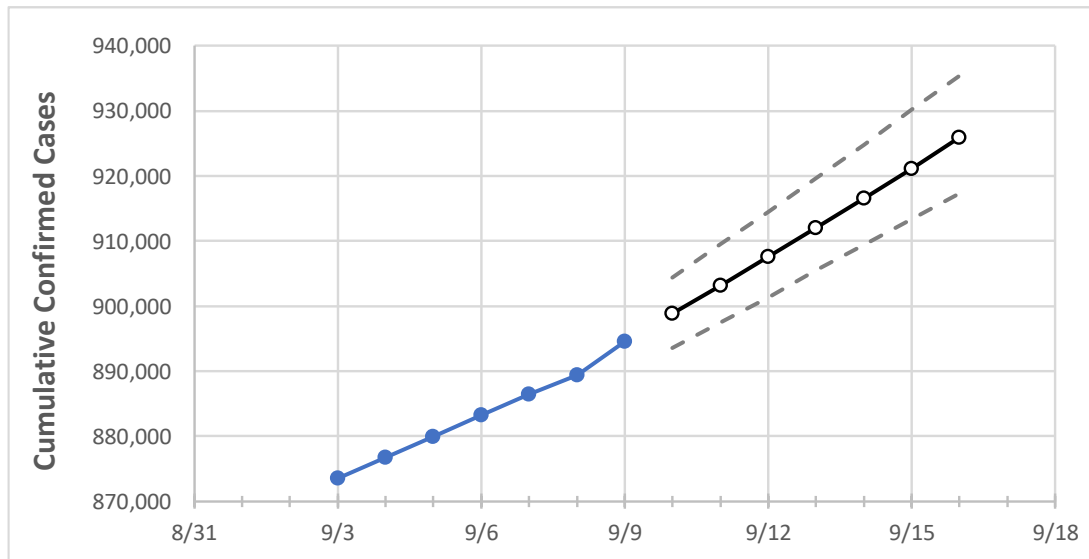
IEM's Modeling Lead

Dr. Prasith "Sid" Baccam is a **Computational Epidemiologist expert** at IEM with more than **20 years of experience in medical consequence modeling and simulation of disease outbreaks** and medical consequences following hypothetical attacks with biological agents or emerging infectious diseases. He develops key simulation models and decision support tools at IEM, specializing in public health, disaster response, and medical countermeasures (MCM) to enhance data-driven decision making and improve modeling assumptions.

Upon receiving his **Ph.D. in Applied Mathematics and Immunobiology** at Iowa State University, Dr. Baccam worked as a Postdoctoral Research Associate at Los Alamos National Laboratory where he focused on researching viral and immunological modeling. After his stint at Los Alamos, Dr. Baccam has served as Task Lead in multiple public health projects have allowed him to develop expertise as a mathematical biologist and a leader on high-performance modeling and simulation teams.

He has worked with state and local public health officials as well as Federal agencies, including **HHS**, the Centers for Disease Control and Prevention (**CDC**), and the Department of Homeland Security (**DHS**). Dr. Baccam has published numerous papers on public health response models and implications on policy and has been invited to participate in workshops and symposiums held by the Institute of Medicine (now the National Academy of Health). His modeling results have been briefed to the **Executive Office of the President** and informed two presidential policy actions.

Indiana State Projections



	Actual Confirmed Cases On:				Projected Cases For:						
	9/6	9/7	9/8	9/9	9/10	9/11	9/12	9/13	9/14	9/15	9/16
Indiana	883,216	886,461	889,362	894,516	898,869	903,145	907,639	912,052	916,556	921,117	925,879

Note: The State's projection shows a "best estimate" curve (the solid line with circles) and the dotted lines are the upper and lower estimates around that best estimate. Our projections have typically been within 10%, and are often within 5%, of actual confirmed cases.

Indiana Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	9/6	9/7	9/8	9/9	9/10	9/11	9/12	9/13	9/14	9/15	9/16
Decatur	3,564	3,583	3,594	3,610	3,634	3,658	3,683	3,707	3,732	3,758	3,782
Hamilton	41,722	41,855	41,943	42,070	42,217	42,370	42,515	42,666	42,819	42,976	43,131
Hendricks	20,839	20,923	21,018	21,082	21,187	21,294	21,399	21,507	21,618	21,729	21,842
Johnson	22,267	22,355	22,425	22,553	22,670	22,786	22,903	23,018	23,135	23,254	23,373
Lake	60,960	61,099	61,246	61,393	61,569	61,746	61,927	62,109	62,299	62,495	62,690
Madison	16,186	16,250	16,313	16,389	16,477	16,563	16,650	16,736	16,825	16,911	17,002
Marion	120,592	120,999	121,426	122,136	122,694	123,253	123,817	124,382	124,971	125,562	126,154
St. Joseph	40,160	40,251	40,301	40,448	40,581	40,718	40,853	40,994	41,140	41,291	41,443

Some recipients of our daily COVID-19 short-term (7 day) projections have requested projections of demand for: hospital bed, intensive care unit (ICU) beds, and mechanical ventilation. We realize that different states and localities will have different characteristics for hospital demand of COVID-19 cases, and we are presenting the best assumptions we could find for those medical demands based on scientific literature and health data reporting. Specifically:

- **Beds:** For hospitalization, we use a range of 10% and 20% of cases require hospitalization based on CDC's report ([MMWR, March 18, 2020](#)) and state reports of COVID-19 cases.
- **ICU:** The CDC report found that 24% of hospitalized cases require ICU care.
- **Ventilators:** Based on clinical data from China and state reports, we assume that 50% of ICU cases require a ventilator.

If you have other estimates for these assumptions, please share them with us as we work to refine our modeling, assumptions, and data on a daily basis.

The medical demands shown in the table assume 20% of **cumulative** confirmed cases require hospitalization. To get the medical demand for the assumption that 10% of confirmed cases require hospitalization, simply divide the demand by 2.

Indiana Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:											
	9/6	9/7	9/8	9/9	9/11				9/13				9/15			
Decatur	3,564	3,583	3,594	3,610	3,658	(732)	[176]	{88}	3,707	(741)	[178]	{89}	3,758	(752)	[180]	{90}
Hamilton	41,722	41,855	41,943	42,070	42,370	(8,474)	[2,034]	{1,017}	42,666	(8,533)	[2,048]	{1,024}	42,976	(8,595)	[2,063]	{1,031}
Hendricks	20,839	20,923	21,018	21,082	21,294	(4,259)	[1,022]	{511}	21,507	(4,301)	[1,032]	{516}	21,729	(4,346)	[1,043]	{521}
Johnson	22,267	22,355	22,425	22,553	22,786	(4,557)	[1,094]	{547}	23,018	(4,604)	[1,105]	{552}	23,254	(4,651)	[1,116]	{558}
Lake	60,960	61,099	61,246	61,393	61,746	(12,349)	[2,964]	{1,482}	62,109	(12,422)	[2,981]	{1,491}	62,495	(12,499)	[3,000]	{1,500}
Madison	16,186	16,250	16,313	16,389	16,563	(3,313)	[795]	{398}	16,736	(3,347)	[803]	{402}	16,911	(3,382)	[812]	{406}
Marion	120,592	120,999	121,426	122,136	123,253	(24,651)	[5,916]	{2,958}	124,382	(24,876)	[5,970]	{2,985}	125,562	(25,112)	[6,027]	{3,013}
St. Joseph	40,160	40,251	40,301	40,448	40,718	(8,144)	[1,954]	{977}	40,994	(8,199)	[1,968]	{984}	41,291	(8,258)	[1,982]	{991}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.